MGS - CR

Solar controller for standard solar systems with electric afterheating

Manual for the specialised craftsman

Mounting
Connection
Operation
Troubleshooting

11207861

Thank you for buying this product.
Please read this manual carefully to get the best performance from this unit. Please keep this manual carefully.

en
Manual

Safety advice

Please pay attention to the following safety advice in order to avoid danger and damage to people and property.

Instructions

Attention must be paid to the valid local standards, regulations and directives!

Target group

These instructions are exclusively addressed to authorised skilled personnel.
Only qualified electricians should carry out electrical works.
Initial installation must be effected by qualified personnel named by the manufacturer.

Description of symbols

WARNING! Warnings are indicated with a warning triangle!

➔ **They contain information on how to avoid the danger described.**

Signal words describe the danger that may occur, when it is not avoided.

- **WARNING** means that injury, possibly life-threatening injury, can occur.
- **ATTENTION** means that damage to the appliance can occur.

➔ Arrows indicate instruction steps that should be carried out.

Note
Notes are indicated with an information symbol.

Information about the product

Proper usage

The solar controller is designed for use in standard solar thermal systems with electric afterheating (immersion heater) in compliance with the technical data specified in this manual.
Improper use excludes all liability claims.

CE-Declaration of conformity

The product complies with the relevant directives and is therefore labelled with the CE mark. The Declaration of Conformity is available upon request, please contact the manufacturer.

Note
Strong electromagnetic fields can impair the function of the controller.

➔ Make sure the controller as well as the system are not exposed to strong electromagnetic fields.

Disposal

- Dispose of the packaging in an environmentally sound manner.
- Dispose of old appliances in an environmentally sound manner. Upon request we will take back your old appliances bought from us and guarantee an environmentally sound disposal of the devices.

Subject to technical change. Errors excepted.

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1 Overview

Solar controller for standard solar systems with electric afterheating

- **Direct connection for electric afterheating**
- **System-Monitoring-Display**
- **Heat quantity measurement**
- **Function control**
- **Operating hours counter**
- **Intuitive operating concept**
- **Slide switch 0 Auto I**
- **VBus® interface**
- **Energy-saving switch-mode power supply**
- **Selection between °C and °F**
- **Selection of sensor type (Pt1000 or KTY)**

Technical data:

Inputs: 3 Pt1000 or KTY temperature sensors

Outputs: 2 high-current relays (potential-free), 1 electro-mechanical relay with change-over contact

Switching capacity:
4 (1) A 240 V~ (electromechanical relay)
4 (1) A 24 V⎓ (potential-free relay)
14 (3) A 240 V~ (high-current relay, potential-free)

Total switching capacity: 4 A 240 V~

Power supply: 100 ... 240 V~ (50 ... 60 Hz)

Supply connection: type Y attachment

Power consumption: < 0.7 W (standby)

Mode of operation: type 1.B action

Rated impulse voltage: 2.5 kV

Data interface: VBus®

VBus® current supply: 35 mA

Functions: differential temperature controller for standard solar thermal systems with electric afterheating. Function control, operating hours counter, tube collector function and heat quantity measurement. The controller is additionally equipped with a time-controlled thermostat function.

Housing: plastic, PC-ABS and PMMA

Mounting: wall mounting

Indication / Display: System-Monitoring-Display for visualisation, 16-segment display, 7-segment display, 8 symbols for system states, background illumination and operating control lamp

Operation: 3 push buttons and 1 slide switch at the front of the housing

Ingress protection: IP 20 / EN 60529

Protection class: II

Ambient temperature: 0 ... 40 °C

Pollution degree: 2

Dimensions: 144 x 208 x 43 mm

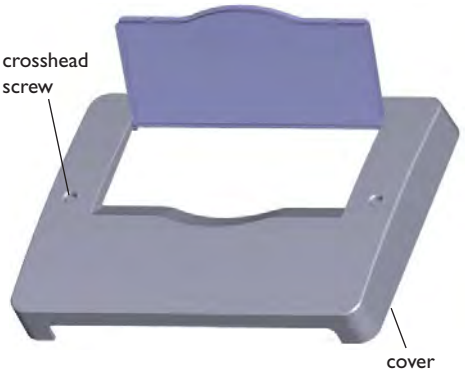
2 Installation

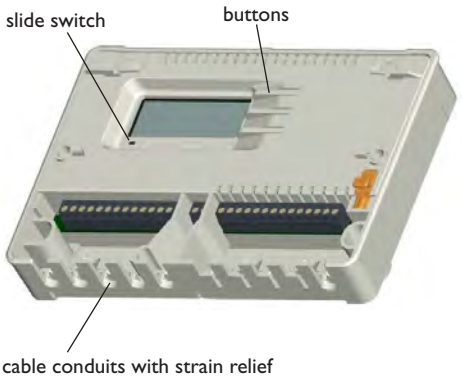
2.1 Mounting

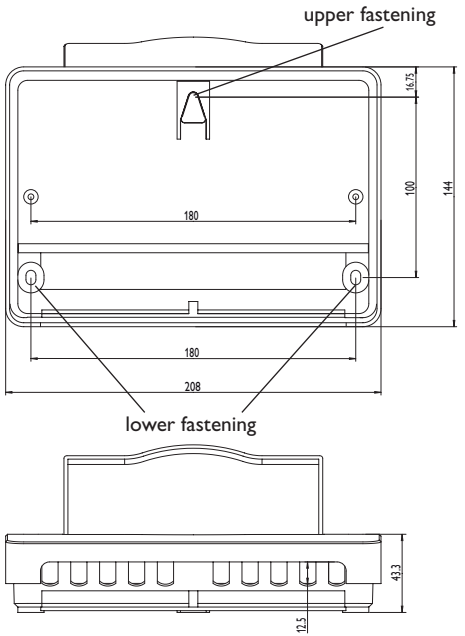
The unit must only be located in dry interior rooms. It is not suitable for installation in hazardous locations and should be protected against electromagnetic fields.

The controller must additionally be supplied from a double pole switch with contact gap of at least 3 mm. Please pay attention to separate routing of sensor cables and mains cables.

- ➔ Unscrew the crosshead screw from the cover and remove the cover
- ➔ Mark the upper fastening point on the wall. Drill and fasten the enclosed wall plug and screw leaving the head protruding
- ➔ Hang the housing from the upper fastening point and mark the lower fastening points (centres 180 mm)
- ➔ Drill and insert the lower wall plug
- ➔ Fasten the housing to the wall with the lower fastening screw and tighten







WARNING! **Electric shock!**

Upon opening the housing, live parts are exposed.

➔ **Always disconnect the controller from power supply before opening the housing!**

2.2 Electrical connection

Note:
Connecting the device to the power supply must always be the last step of the installation!

The controller is equipped with a change-over relay to which a load such as a pump, a valve, etc. can be connected:

10	grounding conductor ⏚
11	grounding conductor ⏚
18	conductor R1-R (normally closed contact)
19	conductor R1-A (normally open contact)
20	neutral conductor N

The controller is equipped with 2 high-current relays for connecting an electric immersion heater of up to 3 kW:

12	grounding conductor ⏚
13	grounding conductor ⏚
14	mains conductor
15	conductor electric immersion heater
16	neutral conductor mains
17	neutral conductor mains electric immersion heater

Depending on the product version, mains cable and sensor cables are already connected to the device. If that is not the case, please proceed as follows:

Connect the **temperature sensors** (S1 to S3) to the corresponding terminals with either polarity:

1/2	sensor 1 (e. g. sensor collector)
3/4	sensor 2 (e. g. sensor store bottom)
5/6	sensor 3 (e. g. sensor store top)

Connect the **VBus®** to the terminals marked "VBus" with either polarity:

7	VBus terminal
8	VBus terminal

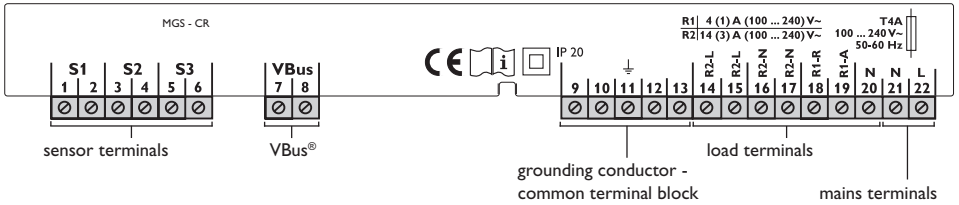
Connect the **mains cable** to the following terminals:

21	neutral conductor N
22	conductor L
9	grounding conductor ⏚

Attach flexible cables to the housing with the enclosed strain relief and the corresponding screws.

The controller is supplied with power via a mains cable. The power supply of the device must be 100 ... 240 V~ (50 ... 60 Hz).

WARNING! **ESD damage!**
Electrostatic discharge can lead to damage to electronic components!
➔ **Take care to discharge properly before touching the inside of the device!**



2.3 Data communication / Bus

The controller is equipped with the VBus® for data transfer with and energy supply to external modules. Carry out the connection at the two terminals marked "VBus" (any polarity). One or more VBus® modules can be connected via this data bus, such as:

- GA3 Large Display from version 1.31
- SD3 Smart Display from version 1.31
- DL2 Datalogger
- VBus® / USB interface adapter
- AM1 Alarm module

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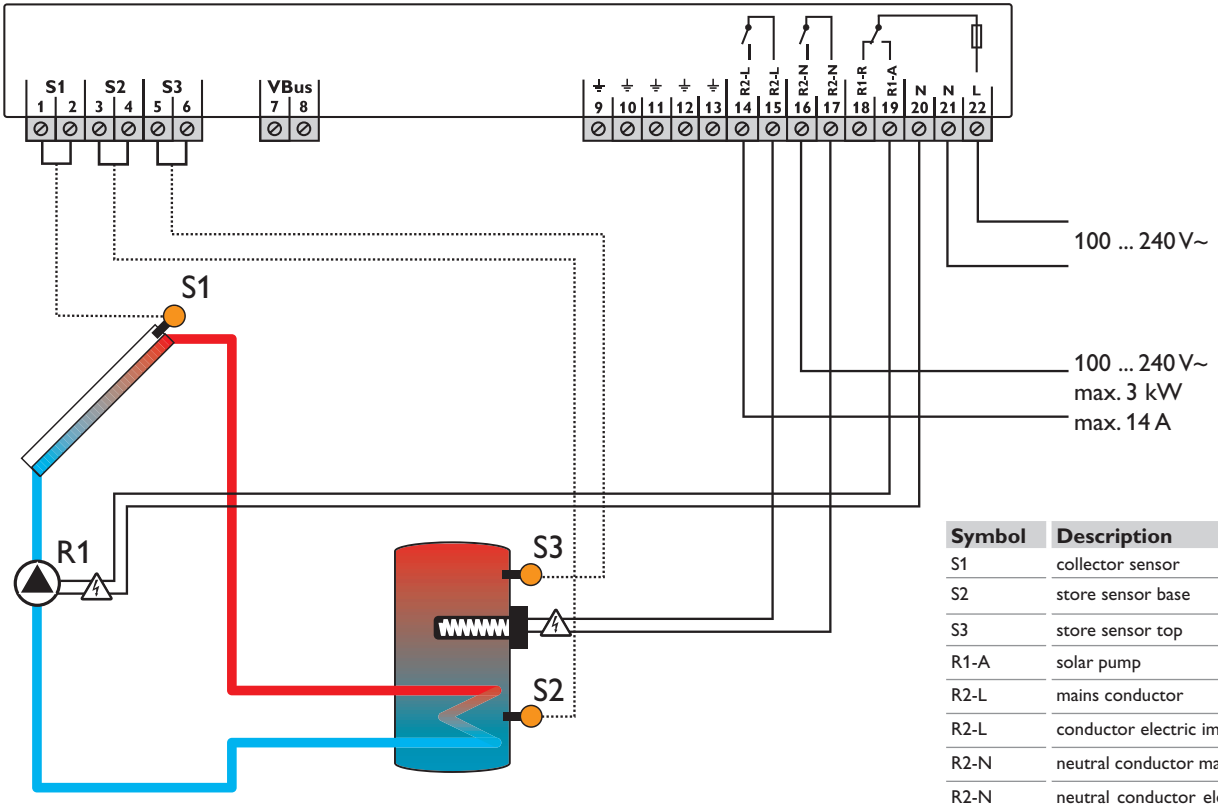
2.4 Terminal allocation

Standard solar system with electric after-heating with one store, one pump and three sensors. Sensors S1/S2 are also used for heat quantity measurement.



Symbol	Description
S1	collector sensor
S2	store sensor base
S3	store sensor top
R1-A	solar pump
R2-L	mains conductor
R2-L	conductor electric immersion heater
R2-N	neutral conductor mains
R2-N	neutral conductor electric immersion heater
⚠	**WARNING! Electric shock!**

3 Operation

3.1 Buttons

The controller is operated via the 3 buttons next to the display.They have the following functions:

- Button 1: scrolling backwards through the menu or increasing adjustment values
- Button 2: scrolling forwards through the menu or decreasing adjustment values
- Button 3: changing into the adjustment mode or confirm

In order to access the adjustment mode, scroll down in the display menu and press button 2 for approx. 3 seconds after you have reached the last display item. If an adjustment value is shown on the display, the SET icon is displayed. Briefly press button 3 in order to access the adjustment mode

3.2 Selecting channels and adjusting values

➔ Select the requested channel using buttons 1 and 2
➔ Briefly press button 3, SET flashes (adjustment mode)
➔ Adjust the value by pressing buttons 1 and 2
➔ Briefly press button 3, so that SET permanently appears; the adjusted value will be saved.

3.3 System-Monitoring-Display

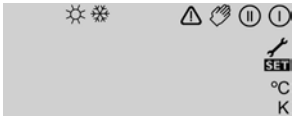
The system monitoring display consists of three blocks: **channel display, tool bar** and **system screen**.

3.3.1 Channel display

Channel display

The **channel display** consists of 2 lines. The upper line is an alpha-numeric 16-segment display (text display) for displaying channel names and menu items. In the lower 7-segment display, channel values and the adjustment parameters are displayed.
Temperatures and temperature differences in °C and K are displayed with the unit. If the indication is set to °F and °Ra, the units are not displayed.

3.3.2 Tool bar

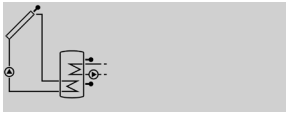


Tool bar

The additional symbols in the tool bar indicate the current system state.

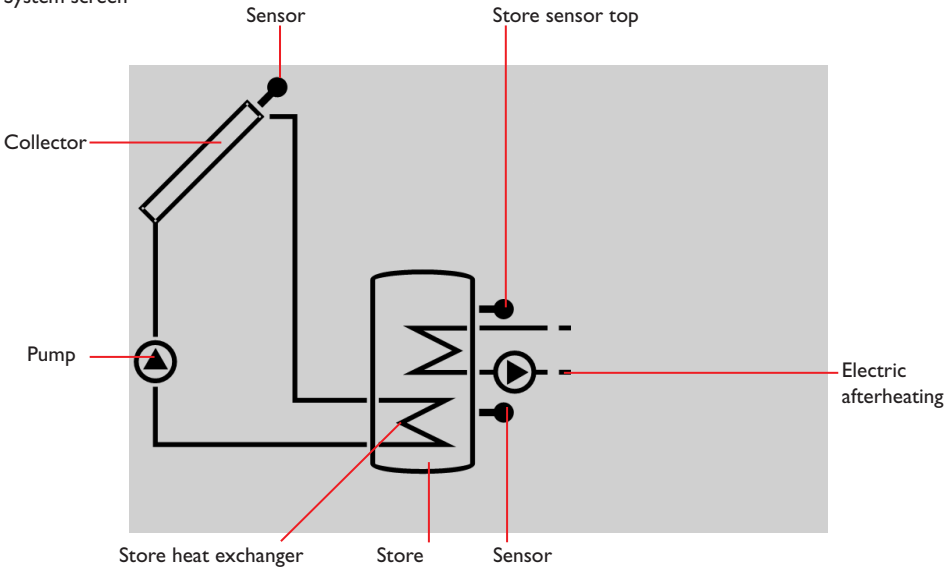
Status	normal	flashing
Relay 1 active	⏻	
Relay 2 active	⏸	
Maximum store limitation active / maximum store temperature exceeded	☼	
Collector cooling function active Store cooling function active	⏻	☼
Antifreeze function activated	❄	
Collector minimum limitation active / antifreeze funtion active		❄
Collector emergency shutdown active or emergency shutdown of the store		⚠
Sensor fault S1 / S2 / S3	🔧	⚠
Manual operation relay 1 active	✋ + ⏻	⚠
Manual operation relay 2 active	✋ + ⏸	⚠
An adjustment channel is being changed - adjustment mode		SET

3.3.3 System screen



The system screen shows the system. The screen consists of several system component symbols, which are flashing depending on the current status of the system (see chap. 3.5.1).

System screen



Collector
with collector sensor

Store
with heat exchanger

Temperature sensor

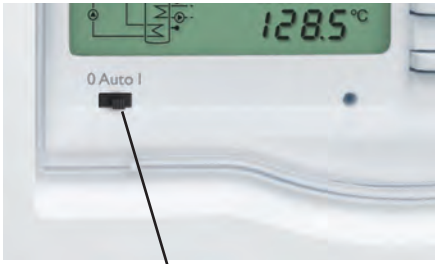
Pump

Electric afterheating (electric immersion heater)

3.4 Slide switch

The allocated relay (see p. 13) can be manually switched on (I), switched off (O) or put into automatic mode (AUTO) by means of the slide switch.

- Manually OFF = 0 (left)
- Manually ON = I (right)
- Automatic mode = Auto (centre)



Slide switch

3.5 Flashing codes

3.5.1 System screen flashing codes

- Pump symbols are flashing if the corresponding relay is active
- Sensor symbols are flashing when the corresponding sensor display channel is selected
- Sensors are flashing quickly in the case of a sensor fault

3.5.2 LED flashing codes

green:	everything OK
red/green flashing:	initialisation phase manual mode
red flashing:	sensor defective (sensor symbol is flashing quickly)

4 Control parameters and display channels

4.1 Channel overview

Channel		Designation	Page
COL	D	Temperature collector	10
TST	D	Temperature store base	10
TSTT	D	Temperature store top	10
h P1	D	Operating hours relay 1	10
h P2	D	Operating hours relay 2	10
kWh	D	Heat quantity kWh	10
MWh	D	Heat quantity MWh	10
TIME	D/C	Time	10

D = Display value
C = Control parameter
C* = Corresponding channel is available when the corresponding option is enabled.

Channel		Designation	Page
DT O	C	Switch-on difference	11
DT F	C	Switch-off difference	11
SMAX	C	Maximum store temperature	11
CEM	C	Collector temperature limitation	11
OCCO	C	Option collector cooling	11
CMAX	C*	Maximum collector temperature	11
OCMN	C	Minimum limitation option	11
CMIN	C*	Minimum collector temperature	11
OCFR	C	Option antifreeze collector	12
CFRO	C*	Antifreeze switch-on temperature	12
CFRF	C*	Antifreeze switch-off temperature	12
OSTC	C	Option store cooling	12
OTC	C	Option tube collector	12
AH O	C	Switch-on temperature thermostat	12
AH F	C	Thermostat switch-off temperature	12
t1(2, 3) O	C	Thermostat switch-on time 1 (2, 3)	13
t1(2, 3) F	C	Thermostat switch-off time 1 (2, 3)	13
FMAX	C	Maximum flow rate	13
MEDT	C	Antifreeze type	13
MED%	C	Antifreeze concentration	13
MAN	C	Manual mode	13
UNIT	C	Temperature unit	13
LANG	C	Language	13
T1(2,3)	C	Sensor type	13
W046 XXXX		Version number	

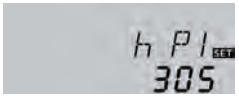
4.2 Display channels

Display of collector temperature
COL:
Collector temperature
Display range:
-40...+260 °C
-40 ...+500 [°F]
Shows the current collector temperature.
• COL: Collector temperature

Display of store temperature at the bottom
TST:
Store temperature
Display range:
-40...+260 °C
-40 ...+500 [°F]
Shows the current store temperature.
• TST: Temperature store base

Display of store temperature at the top
TSTT:
Temperature
of the store at the top
Display range:
-40...+260 °C
-40 ...+500 [°F]
Shows the current store temperature at the top.
• TSTT: Temperature store top

Operating hours counter
h P1 / h P2:
Operating hours counter
Display channel



The operating hours counter accumulates the solar operating hours (**h P1**) and the operating hours of the afterheating (**h P2**) respectively. Full hours are displayed.

The accumulated operating hours value can be set back to 0. As soon as one operating hours channel is selected, the **SET** symbol is displayed.

➔ In order to access the RESET-mode of the counter, press the SET (3) button for approx. two seconds.
➔ The display symbol **SET** will flash and the operating hours will be set to 0.
➔ Confirm the reset with the SET button in order to finish the reset.

In order to interrupt the RESET-process, do not press a button for about five seconds. The display returns to the display mode.

Heat quantity
kWh/MWh:
Heat quantity in
kWh / MWh
Display channel

Information on flow rate, antifreeze (-/concentration) and the temperature difference between the reference sensors S1 (flow) and S2 (return) are used for determining the heat quantity delivered. It is shown in kWh in the channel **kWh** and in MWh in the channel **MWh** . The overall heat quantity results from the sum of both values.
The accumulated heat quantity value can be set back to 0. As soon as one of the display channels of the heat quantity is selected, the **SET** symbol is displayed.

➔ In order to access the RESET-mode of the counter, press the SET (3) button for approx. two seconds.

The display symbol **SET** will flash and the heat quantity will be set to 0.

➔ Confirm the reset with the **SET** button in order to finish the reset.

In order to interrupt the RESET-process, do not press a button for about five seconds. The display returns to the display mode.

Time
TIME:
Shows the current
clock time.

➔ In order to adjust the hours press button 3 for two seconds
➔ Adjust the hours by pressing buttons 1 and 2
➔ In order to adjust the minutes press button 3
➔ Adjust the minutes by pressing buttons 1 and 2
➔ In order to save the adjustment press button 3

4.3 Adjustment channels

In order to access the adjustment mode, scroll down in the display menu and press button 2 for approx. three seconds after you have reached the last display item. If an adjustment value is shown on the display, the **SET** icon is displayed. Now, you can access the adjustment mode by pushing button 3. **SET** flashes.

Note:
The adjustment values should only be altered by qualified personnel. Otherwise, the system may not function faultlessly!

ΔT- regulation

DT O:

Switch-on temperature difference
Adjustment range:
1.0...50.0 K
4.0 K; 90.0 [°Ra]
Factory setting:
6.0 K; 12.0 [°Ra]

DT F:

Switch-off temperature difference
Adjustment range:
0.5...49.5 K
1.0...89.0 [°Ra]
Factory setting:
4.0 K; 8.0 [°Ra]

Note:
The switch-on temperature difference must be at least 0.5K (1 °Ra) higher than the switch-off temperature difference.

If the switch-on difference (**DTO**) is reached, the pump (R1) is activated. If the temperature difference falls below the adjusted switch-off temperature difference (**DT F**) the controller switches off the pump.

Maximum store temperature

SMAX:

Maximum store temperature
Adjustment range:
4...95 °C
40...200 [°F]
Factory setting:
60 °C; 140 [°F]
hysteresis:2 K [4 °Ra]

Note:
The controller is also equipped with a non-adjustable emergency shutdown if the store reaches 95 °C (200 °F).

Once the adjusted maximum temperature is exceeded, the solar pump is switched off and further loading of the store is prevented to reduce scald risk or system damage. The ☀ symbol is shown on the display if the store temperature exceeds the maximum value. S2 is used as the reference sensor.

Collector temperature limitation for emergency shutdown

CEM:

Collector temperature limitation
Adjustment range:
80...200 °C
170...390 [°F]
Factory setting:
130 °C; 270 [°F]
hysteresis: 10 K; 20 [°Ra]

If the adjusted collector emergency shutdown temperature (**CEM**) is exceeded, the controller switches off the solar pump in order to protect the system against overheating.
The factory setting is 130°C (270 °F) but it can be changed within the adjustment range of 80...200°C (170 ... 390 °F). ⚠ (flashing) is shown if the collector emergency shutdown temperature is exceeded.

Collector cooling

OCCO:

Option collector cooling
Selection: OFF/ON
Factory setting: OFF

CMAX:

Collector maximum temperature
Adjustment range:
70...160 °C
150... 320 [°F]
Factory setting:
110 °C; 230 [°F]
hysteresis: 5 K; 10 [°Ra]

This function protects the collector against overheating.
When the adjusted maximum store temperature is reached, the solar pump is switched off. As soon as the collector temperature reaches the adjusted maximum collector temperature (**CMAX**) the solar pump is activated until the collector temperature is 5 K (10 °Ra) lower than the maximum temperature. The store temperature may increase, but only up to 95 °C (200 °F) (emergency shutdown of the store).

Option collector minimum limitation

OCMN:

Minimum collector limitation
Selection: OFF/ON
Factory setting: OFF

CMIN:

Minimum collector temperature
Adjustment range:
10...90 °C
50...190 [°F]
Factory setting:
10 °C; 50 [°F]

en

The collector minimum limitation option prevents the solar pump from being switched on too often at low collector temperatures. When this option is activated, the collector minimum temperature can be adjusted.
The collector minimum temperature is the temperature which must be exceeded for the solar pump (R1) to switch on. If the temperature falls below the minimum temperature, ❄ (flashing) is shown.

Antifreeze option
OCFR:
Antifreeze function
Selection: OFF/ON
Factory setting: OFF

CFRO:
Antifreeze switch-on temperature
Adjustment range:
-40...+8 °C
-40...+46 [°F]
Factory setting:
4.0 °C; 40 [°F]

CFRF:
Antifreeze switch-off temperature
Adjustment range:
-39...+9 °C
-39...48 [°F]
Factory setting:
6,0 °C; 42 [°F]

Note:
Since this function uses the limited heat quantity of the store, the antifreeze function should be used in regions with few days of temperatures around the freezing point.

The antifreeze function activates the loading circuit between the collector and the store when the temperature falls below the adjusted temperature **CFRO**. This will protect the fluid against freezing or coagulating. If **CFRF** is exceeded, the solar pump will be switched off again.
The antifreeze function will be suppressed if the store temperature falls below 5 °C.

Note:
This function can only become active if the store temperature is higher than the collector temperature.

Store cooling
OSTC:
Option store cooling
Selection: OFF/ON
Factory setting: OFF

When the store cooling function is activated, the controller aims to cool down the store during the night in order to prepare it for solar loading on the following day. If the adjusted maximum store temperature (**SMAX**) is exceeded and the collector temperature falls below the store temperature, the system will be reactivated in order to cool down the store until the store temperature falls below the maximum store temperature by 2 K (4 °Ra).
Reference temperature differences are **DT O** and **DT F**.

Tube collector function
O TC:
Tube collector function
Adjustment range:
OFF/ON
Factory setting: OFF

This function helps overcome the non-ideal sensor position with some tube collectors.
If the controller detects an increase in collector temperature by 2 K (4 °Ra) compared to the previously stored collector temperature, the solar pump will be switched on for about 30 s in order to detect the fluid temperature. The current collector temperature will be saved as a new reference value. If the measured temperature (new reference value) is exceeded by 2 K (4 °Ra), the solar pump will run for 30 s. If the switch-on difference between the collector and the store is exceeded during the runtime of the solar pump, the controller will automatically switch to solar loading.
If the collector temperature decreases by 2 K (4 °Ra) during a loading break, the switch-on value for the tube collector function will be recalculated.

Thermostat function for afterheating
AH O:
Thermostat switch-on temperature
Adjustment range:
0...95 °C
30...200 [°F]
Factory setting:
40 °C; 110 [°F]

AH F:
Thermostat switch-off temperature
Adjustment range:
0...95 °C
30...200 [°F]
Factory setting:
45 °C; 120 [°F]

Note:
The thermostat switch-on temperature can only be smaller than or equal to the thermostat switch-off temperature.

The thermostat function works independently from the solar operation and can be used for afterheating. Reference sensor for this function is S3.
If the temperature falls below the thermostat switch-on temperature **AH O**, relay R2 is energised for afterheating. If the thermostat switch-off temperature **AH F** is exceeded, the relay switches off.

The thermostat function is deactivated, if the thermostat switch-on temperature and the thermostat switch-off temperature are set to an identical value.

t1 (2, 3) O:
Thermostat switch-on time
Adjustment range: 00:00 23:45
Factory setting: 00:00

t1 (2, 3) F
Thermostat switch-off time
Adjustment range: 00:00 23:45
Factory setting: 00:00

In order to block the thermostat function for a certain period, there are three time frames t1 ... t3. The switch-on and switch-off times can be adjusted in steps of 15 minutes.
If the thermostat function should run from 06:00 a.m. and 09:00 a.m. only, adjust t1O to 06:00 a.m. and t1F to 09:00 a.m.
If the switch-on and switch of times of a frame are set to an identical value, the time frame is inactive.
If all time frames are set to 00:00, the thermostat function is solely temperature dependent.

Heat quantity measurement
FMAX:
flow rate in l/min
Adjustment range: 0.5...100
in steps of 0.1
Factory setting: 3.0

MEDT:
Antifreeze type
Adjustment range: 0...3
Factory setting: 1

MED%:
concentration of antifreeze in (Vol-) %
MED% is "hidden" when MEDT 0 or 3 is used
Adjustment range: 20...70
Factory setting: 45
The heat quantity measurement takes place between sensors S1 and S2.

➔ Read the flow rate (l/min) from the flow gauge and adjust it in the **FMAX** channel.
➔ Adjust the antifreeze type used in the **MEDT** channel.
➔ If propylene or ethylene glycol is used, adjust the antifreeze concentration in the **MED%** channel.

Antifreeze type:
0 : water
1 : propylene glycol
2 : ethylene glycol
3 : Tyfocor® LS / G-LS

Manual mode
MAN:
Manual mode
Adjustment range: 0, 1, 2
Factory setting: 1

In this channel, one ot both relays can be allocated to the slide switch. The allocated relay or relays respectively can be manually switched on (I), switched off (O) or put into automatic mode (AUTO) by means of the slide switch (see p. 8).
Relay allocation:
- 0 = relay 1 and relay 2
- 1 = relay 1
- 2 = relay 2

WARNING!

Danger of overheating!
If allocation 0 or 2 is selected, the switch-off condition of an electric immersion heater connected will be ignored!
➔ **Manually switch off the relay!**

Temperature units
UNIT:
Temperature unit
Selection: °C / °F
Factory setting: °C

In this adjustment channel the temperature unit can be chosen. The unit can be switched between °C and °F during operation.
Temperatures and temperature differences in °C and K are displayed with the unit. If the indication is set to °F and °Ra, the units are not displayed.

Language
LANG:
Language selection
Selection: dE, En, It, Fr, Es
Factory setting: En

In this adjustment channel, the menu language can be chosen: dE: German, En: English, It: Italian, Fr: French, Es: Spanish

Sensor type
T1 (2,3):
Sensor type
Selection: 1, 2
Factory setting: 1

Adjustment channel for selecting the sensor type. The sensor type can be switched between Pt1000 and KTY characteristics during operation.
- 1 = Pt1000
- 2 = KTY

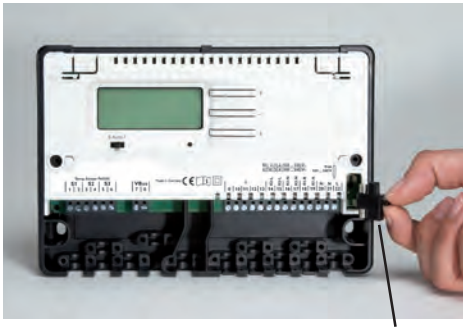
ATTENTION!

System damage!
Selecting the wrong sensor type will lead to unwanted controller actions. In the worst case, system damage can occur!
➔ **Make sure that the right sensor type is selected!**

5 Troubleshooting

If a malfunction occurs, the tool bar symbols will display an error code (see chap. 3.3.2).

WARNING! **Electric shock!**
Upon opening the housing, live parts are exposed.
➔ **Always disconnect the controller from power supply before opening the housing!**



The controller is protected by a fuse. The fuse holder (which also holds the spare fuse) becomes accessible when the cover is removed. To replace the fuse, pull the fuse holder from the base.

Operating control lamp flashes red. The symbol is indicated on the display and the symbol ⚠ flashes.

Sensor fault. An error code instead of a temperature is shown on the sensor display channel.

888.8 — Cable is broken. Check the cable.

- 88.8 — Short circuit. Check the cable.

Wrong sensor type? — Allocate the sensor type correctly.

Disconnected temperature sensors can be checked with an ohmmeter. Please check the resistance values correspond with the table.

°C	°F	Ω Pt1000	Ω KTY	°C	°F	Ω Pt1000	Ω KTY
-10	14	961	1499	55	131	1213	2502
-5	23	980	1565	60	140	1232	2592
0	32	1000	1633	65	149	1252	2684
5	41	1019	1702	70	158	1271	2778
10	50	1039	1774	75	167	1290	2874
15	59	1058	1847	80	176	1309	2971
20	68	1078	1922	85	185	1328	3071
25	77	1097	2000	90	194	1347	3172
30	86	1117	2079	95	203	1366	3275
35	95	1136	2159	100	212	1385	3380
40	104	1155	2242	105	221	1404	3484
45	113	1175	2327	110	230	1423	3590
50	122	1194	2413	115	239	1442	3695

resistance values of Pt1000 sensors and KTY sensors

Operating control lamp is permanently off.

Check the power supply of the controller. Is it disconnected?

- no → The fuse of the controller could be blown. The fuse holder (which holds the spare fuse) becomes accessible when the cover is removed. The fuse can then be replaced.
- yes → Check the supply line and reconnect it.

5.1 Miscellaneous

Pump is overheated, but no heat transfer from the collector to the store, flow and return have the same temperature; perhaps also bubbling in the lines.

Air or gas bubbles in the system?

- yes → Vent the system; increase the system pressure to a static primary pressure of at least plus 0,5 bar; if necessary continue to increase pressure; switch the pump off and on for a short time.
- no → Is the collector circuit blocked at the dirt trap?
  - yes → Clean dirt trap

Pump starts for a short moment, switches off, switches on again, etc.

Temperature difference at the controller too small?

- yes → Change ΔTon and ΔToff correspondingly.
  - no → o.k.
- no → Wrong position of collector sensor?
  - yes → Mount the collector sensor at solar flow (warmest collector output); use immersion sleeve of the respective collector.
  - no → Plausibility control of the option tube collector function

Pump starts up very late.

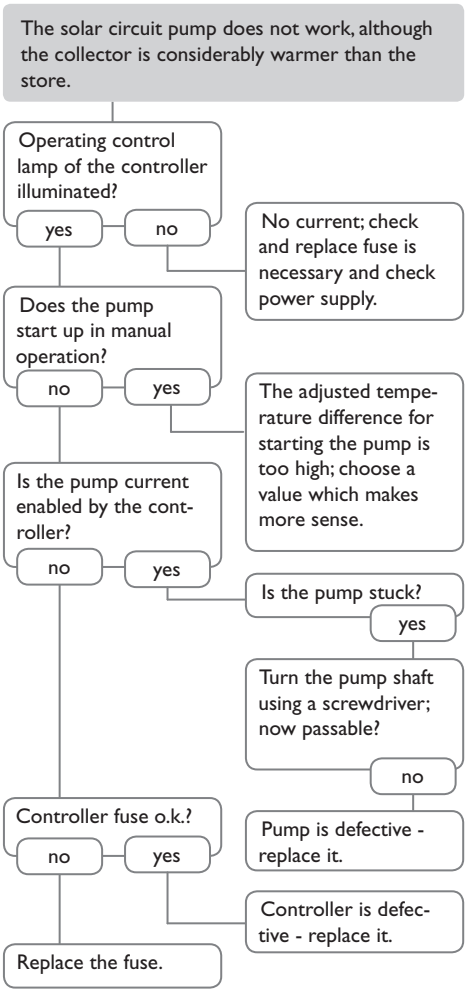
Switch-on temperature difference ΔTon too large?

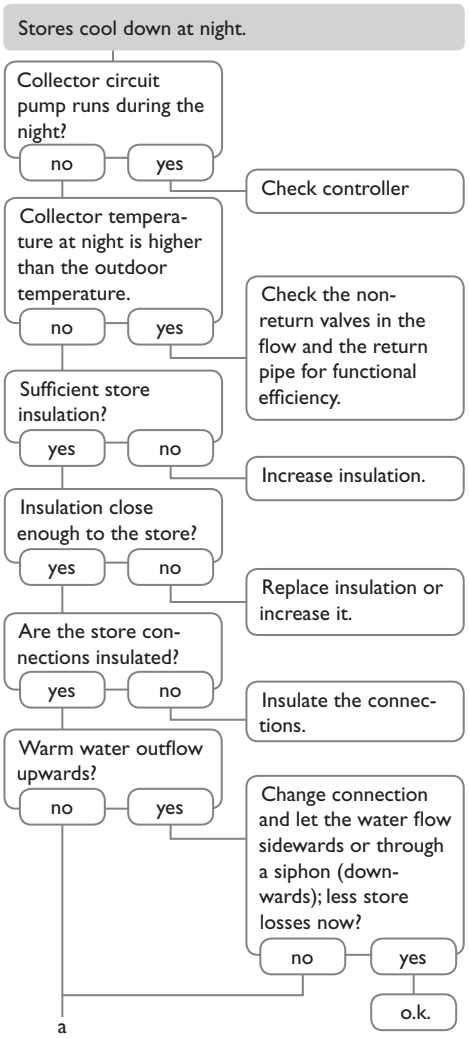
- yes → Change ΔTon and ΔToff correspondingly.
- no → Non-ideal position of the collector sensor (e.g. flatscrew sensor instead of sensor in immersion sleeves).
  - yes → Activate tube collector function if necessary
    - o.k.

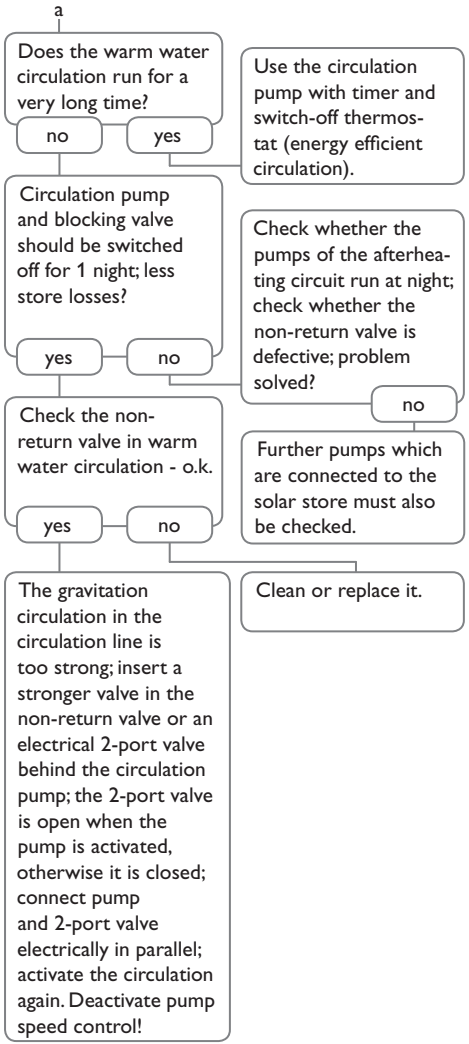
The temperature difference between store and collector increases enormously during operation; the collector circuit cannot dissipate the heat.

Collector circuit pump defective?

- yes → Check/replace it
- no → Heat exchanger calcified?
  - yes → Decalcify it
  - no → Heat exchanger blocked?
    - yes → Clean it
    - no → Heat exchanger too small?
      - yes → Replace with correctly sized one.


The solar circuit pump does not work, although the collector is considerably warmer than the store.
Operating control lamp of the controller illuminated?
yes
no
No current; check and replace fuse is necessary and check power supply.
Does the pump start up in manual operation?
no
yes
The adjusted temperature difference for starting the pump is too high; choose a value which makes more sense.
Is the pump current enabled by the controller?
no
yes
Is the pump stuck?
yes
Turn the pump shaft using a screwdriver; now passable?
no
Pump is defective - replace it.
Controller fuse o.k.?
no
yes
Controller is defective - replace it.
Replace the fuse.


Stores cool down at night.
Collector circuit pump runs during the night?
no
yes
Check controller
Collector temperature at night is higher than the outdoor temperature.
no
yes
Check the non-return valves in the flow and the return pipe for functional efficiency.
Sufficient store insulation?
yes
no
Increase insulation.
Insulation close enough to the store?
yes
no
Replace insulation or increase it.
Are the store connections insulated?
yes
no
Insulate the connections.
Warm water outflow upwards?
no
yes
Change connection and let the water flow sidewards or through a siphon (downwards); less store losses now?
no
yes
o.k.
a


a
Does the warm water circulation run for a very long time?
no
yes
Use the circulation pump with timer and switch-off thermostat (energy efficient circulation).
Circulation pump and blocking valve should be switched off for 1 night; less store losses?
yes
no
Check whether the pumps of the afterheating circuit run at night; check whether the non-return valve is defective; problem solved?
no
Further pumps which are connected to the solar store must also be checked.
Check the non-return valve in warm water circulation - o.k.
yes
no
Clean or replace it.
The gravitation circulation in the circulation line is too strong; insert a stronger valve in the non-return valve or an electrical 2-port valve behind the circulation pump; the 2-port valve is open when the pump is activated, otherwise it is closed; connect pump and 2-port valve electrically in parallel; activate the circulation again. Deactivate pump speed control!

6 Accessories

6.1 Sensors

Sensors
The product range includes high-precision platinum temperature sensors, flatscrew sensors, outdoor temperature sensors, indoor temperature sensors, cylindrical clip-on sensors, also as complete sensors with immersion sleeve.

Overvoltage protection device
In order to avoid overvoltage damage at collector sensors (e.g. caused by local lightning storms), we recommend installting the overvoltage protection SP10.

6.2 VBus® accessories

Smart Display SD3 / Large display module GA3
The GA3 and SD3 display modules are used for visualising data issued by the controller: collector temperature, store temperature and energy yield of the solar thermal system. The use of high-efficiency LEDs and filter glass assures a high optical brilliance and good readability even in poor visibility conditions and from a larger distance. Both display modules are connected to the controller via the VBus®.

VBus® / USB interface adapter
The new VBus® / USB interface adapter is the interface between the controller and a personal computer. With its standard mini-USB port it enables a fast transmission of system data for processing, visualising and archiving as well as the parametrisation of the controller via the VBus®. A full version of the Service-Center software is included.

DL2 Datalogger
This additional module enables the acquisition and storage of large amounts of data (such as measuring and balance values of the solar system) over a long period of time. The DL2 can be confi gured and read-out with a standard internet browser via its integrated web interface. For transmission of the data stored in the internal memory of the DL2 to a PC, an SD card can be used. The DL2 is appropriate for all controllers with VBus®. It can be connected directly to a PC or router for remote access and thus enables comfortable system monitoring for yield monitoring or for diagnostics of faults.

AM1 Alarm module
The AM1 Alarm module is designed to signal system failures. It is to be connected to the VBus® of the controller and issues an optical signal via the red LED if a failure has occurred. The AM1 also has a potential-free relay output, which can e. g. be connected to a building management system (BMS). Thus, a collective error message can be issued in the case of a system failure.

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